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(54) **METHOD AND DEVICE FOR STORING AUDIO-CENTERED INFORMATION BY A TABLE-OF-CONTENTS MECHANISM AND A FILE-BASED ACCESS MECHANISM**

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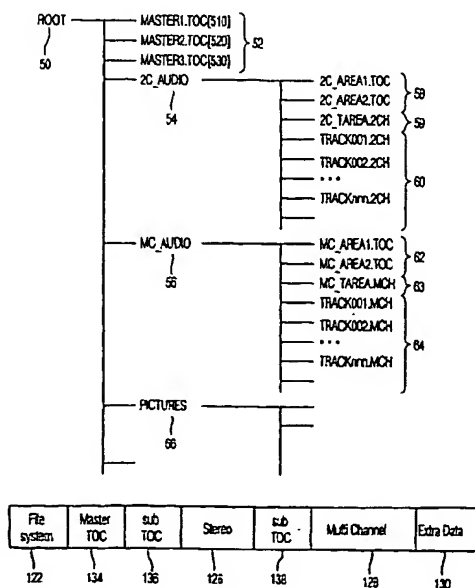
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(57) **ABSTRACT**

Audio-centered information is stored on a unitary medium by a Table-of-Contents (TOC) mechanism for specifying an actual configuration of various audio items on the medium. In addition to the TOC mechanism a file-based access mechanism to the information is assigned through a ROOT directory that contains a highest level TOC directory pointing at various audio items.

30 Claims, 4 Drawing Sheets

2C_AREA.TOC 58 and in parallel therewith to the various stereo tracks TRACKn.2CH 60. Furthermore, there is MC_AUDIO directory 56. This points to TOC MC_AREA.TOC 62 and in parallel therewith to the various stereo tracks TRACKn.MCH 64. In consequence, the tracks may be accessed either via the associated directories, or rather via the file system that may have MASTER.TOC and sub-TOCS as files. However, double storage facilities therefor are superfluous, inasmuch as the directories need only to refer to the TOC or TOCS. For reasons of safety, the master TOCs have been provided in triplicate. Furthermore, the subaltern or AREA.TOCs have been provided in duplicate. Next, to audio, the system may be organized for containing still further items, such as pictures that also have their directory 66. As an additional extra, 2C_TAREA.2CH 59 and MC_TAREA.MCH contain all associated tracks.

FIG. 5 shows a first storage arrangement for use with the invention, which by way of example has been represented as a single serial track. Along the horizontal axis the following items are evident. Item 120 is a Lead-in area that is used for mutually synchronizing the reader and the driving of the medium. Item 122 represents the File System that has been disclosed with reference to FIG. 4. Item 124 represents a TOC that may be configured according to standard procedures and pertains to subsequent items Stereo Audio Item 126 and Multi-channel Audio Item 128, and if necessary also to Extra Data Item 130. The size of item 124 need not be standardized, inasmuch as various different amounts of information may be present. Item 126 represents Stereo Audio Information, that may be defined according to a conventional standard and by itself does not constitute part of the invention. Item 128 represents Multi Channel Audio Information, that may be defined according to a conventional standard and by itself does not constitute part of the invention. Generally, the two audio areas may have the same structure and contain the same piece of audio, apart from the distinguishing definitions of the various channels. The audio may be plain coded or lossless coded. All kinds of audio may be multiplexed with supplementary data, such as Compact Disc Text.

Item 130 represents Extra Data Information that may be defined in a conventional standard and by itself does not form part of the invention. Item 132 represents a Lead-Out Information. The latter is in particular used during search operations. The lead-out may cover a ring of some 0.5 to 1 millimeter wide. According to the above, the stored information may be accessed either via the file system as laid down in item 122, or via the TOC structure laid down in item 124, and more particular, via a two- or multi-level TOC structure to be discussed hereinafter.

FIG. 6 shows a second storage arrangement for use with the invention, and in particular pertaining to a two-level TOC structure. Along the horizontal axis the following items are evident, next to items that have already been shown in FIG. 3 and carry the same reference numerals. For clarity, items 120 and 132 have been suppressed.

Item 134 represents the Master TOC that begins at a uniformly standardized offset position with respect to the start of the Lead-in area at byte number 510, copies at 520, 530. According to the embodiment, the Master-TOC measures only one standard-size sector and primarily contains pointers to the various Sub-TOCs or Area-TOCs to be disclosed hereinafter. A preferred syntax of the Master-TOC has a header with a Signature that identifies the Master-TOC, such as by "SACD Master TOC". Further, Tables 1 and 2 specify the precise syntax of the MASTER_TOC. The syntax has been given in elementary computer notation,

together with the associated lengths and formats. Master_TOC_Signature is an 8 byte string identifying the Master TOC. The value of Master_TOC_Signature must be "SACDMTOC"($53 $41 $43 $44 $4D $54 $4F $43).

Likewise Table 3 specifies the disc info syntax in the same manner. In particular:

2CH_TOC_1_Address is a 5 byte integer containing the logical sector number (LSN) of the first sector of Area TOC-1 in the 2 Channel Stereo Area. If the 2-Channel Stereo Area is not present, the value of 2CH_TOC_1_Address must be zero.

2CH-TOC_2_Address is a 4 byte integer containing the LSN of the first sector of Area TOC-2 in the 2 Channel Stereo Area. if the 2-Channel Stereo Area is not present, the value of 2CH_TOC_2_Address must be zero.

MC_TOC_1_Address is a 4 byte integer containing the LSN of the first sector of Area TOC-1 in the Multi Channel Stereo Area. If the Multi Channel Area is not present, the value of MC_TOC_1_Address must be zero.

MC_TOC_2_Address is a 4 byte integer containing the LSN of the first sector of Area TOC-2 in the Multi Channel Stereo Area. If the Multi Channel Area is not present, the value of MC_TOC_2_Address must be zero.

The format of Disc_Flags must be as follows: a hybrid bit and seven reserved bits.

The Hybr bit must be set to one on a Hybrid Disc. The Hybr bit must be set to zero on a not-Hybrid Disc.

List of Related Documents

(D1) Research Disclosure number 36411. August 1994, page 412–413

(D2) PCT/IB97/01156 (PHN 16.452) 1 bit ADC and lossless compression of audio

(D3) PCT/IB97/01303 (PHN 16.405) Audio compressor

(D4) EP-A 402,973 (PHN 13.241) Audio compression

(D5) 'A digital decimating filter for analog-to-digital conversion of hi-fi audio signals', by J. J. van der Kam in Philips Techn. Rev. 42, no. 6/7, April 1986, pp. 230–8

(D6) 'A higher order topology for interpolative modulators for oversampling A/D converters', by Kirk C. H. Chao et al in IEEE Trans. on Circuits and Systems, Vol 37, no. 3, March 1990, pp. 309–18.

What is claimed is:

1. An audio-centered information structure, comprising
a unitary storage medium;
audio information stored on the unitary storage medium;
a Table-of-Contents (TOC) mechanism stored on the unitary storage medium, wherein the TOC mechanism includes a data-based TOC for storing and accessing the audio information; and
a file-based access mechanism stored on the unitary storage medium, wherein the file-based access mechanism includes a directory-based TOC for storing and accessing the audio information.

2. The audio-centered information structure of claim 1, wherein the file-based access mechanism includes a root directory, and wherein the root directory points to MASTER.TOC files.

3. The audio-centered information structure of claim 2, wherein the root directory includes at least one AUDIO subaltern directory.

4. The audio-centered information structure of claim 3, wherein the at least one AUDIO subaltern directory includes a first AUDIO subaltern directory selected from the group consisting of a 2C_AUDIO subaltern directory, a MC_AUDIO subaltern directory, and a combination thereof.

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5. The audio-centered information structure of claim 3, wherein the at least one AUDIO subaltern directory points to stereo tracks and to a TOC for the audio information.

6. The audio-centered information structure of claim 2, wherein the root directory includes a PICTURES subaltern directory.

7. The audio-centered information structure of claim 1, wherein the file-based access mechanism is based on a UDF file system or an ISO 9660 file system.

8. The audio-centered information structure of claim 1, wherein the TOC mechanism includes a one-level TOC structure.

9. The audio-centered information structure of claim 1, wherein the TOC mechanism includes a two-level TOC structure.

10. The audio-centered information structure of claim 9, wherein the TOC mechanism includes a Master TOC.

11. The audio-centered information structure of claim 1, wherein the TOC mechanism includes an item selected from the group consisting of a Multi-channel Audio Item, a Stereo Audio Information, an Extra Data Item, and combinations thereof.

12. The audio-centered information structure of claim 1, wherein the TOC mechanism and the file-based access mechanism are stored on a single serial track of the unitary storage medium.

13. The audio-centered information structure of claim 1, wherein the unitary storage medium includes an optically readable disc.

14. The audio-centered information structure of claim 1, wherein the audio information is stored in lossless compression format.

15. The audio-centered information structure of claim 1, wherein the audio information is stored in lossy compression format.

16. A method for storing audio-centered information, comprising the steps of:

provding a unitary storage medium;

storing audio information on the unitary storage medium;

forming a Table-of-Contents (TOC) mechanism on the unitary storage medium, wherein the TOC mechanism includes a data-based TOC for storing and accessing the audio information; and

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forming a file-based access mechanism on the unitary storage medium, wherein the file-based access mechanism includes a directory-based TOC for storing and accessing the audio information.

17. The method of claim 16, wherein the file-based access mechanism includes a root directory, and wherein the root directory points to MASTER.TOC files.

18. The method of claim 17, wherein the root directory includes at least one AUDIO subaltern directory.

19. The method of claim 18, wherein the at least one AUDIO subaltern directory includes a first AUDIO subaltern directory selected from the group consisting of a 2C_AUDIO subaltern directory, a MC_AUDIO subaltern directory, and a combination thereof.

20. The method of claim 18, wherein the at least one AUDIO subaltern directory points to stereo tracks and to a TOC for the audio information.

21. The method of claim 17, wherein the root directory includes a PICTURES subaltern directory.

22. The method of claim 16, wherein the file-based access mechanism is based on a UDF file system or an ISO 9660 file system.

23. The method of claim 16, wherein the TOC mechanism includes a one-level TOC structure.

24. The method of claim 16, wherein the TOC mechanism includes a two-level TOC structure.

25. The method of claim 24, wherein the TOC mechanism includes a Master TOC.

26. The method of claim 16, wherein the TOC mechanism includes an item selected from the group consisting of a Multi-channel Audio Item, a Stereo Audio Information, an Extra Data Item, and combinations thereof.

27. The method of claim 16, wherein the TOC mechanism and the file-based access mechanism are stored on a single serial track of the unitary storage medium.

28. The method of claim 16, wherein the unitary storage medium includes an optically readable disc.

29. The method of claim 16, wherein the audio information is stored in lossless compression format.

30. The method of claim 16, wherein the audio information is stored in lossy compression format.

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